REMARKS

This is a Second Preliminary Amendment for the above-identified patent application. By this Amendment, Claims 1-7 have been canceled and are being replaced with new Claims 8-15.

Claim 8 and 11 are independent. Claim 8 is directed to a method of continuously measuring the flatness of a moving hot metal strip comprising projecting a shadow in the form of a line pattern onto the moving hot metal strip and detecting the line pattern on the moving hot metal strip with a camera. For the reasons set forth below, Applicants respectfully submit that Claim 8 is neither shown nor suggested in the art previously submitted and/or submitted herewith.

In earlier Office Actions, the Patent Office has taken the position that U.S. Patent No. 5,488,478 shows the features of the (then-pending) claims, including the feature of projecting a shadow in the form of a line pattern onto a moving strip. Applicants submit that the '478 patent does not disclose or suggest "projecting," as that term is used in the present application and as it is commonly understood in the field of optics. The term "projection" is used here as it is commonly used in the field of optics, namely, as a reproduction of a model onto a projection surface by means of an optical system. It is not intended to mean a geometrical projection, as

suggested, for example, in U.S. Patent No. 5,488,478. That patent neither shows nor suggests an optical projection of an optical master, as contemplated by the present invention. Similarly, other prior art documents do not show or suggest the projection of a shadow onto a moving hot metal strip.

The projection of lines of light (or shadows) for the purpose of evaluating the surface of an object is known. U.S. Patent No. 5,367,378, previously cited by the Patent Office, is an example of such projection. However, U.S. Patent No. 5,367,378 is not directed to measuring the flatness of a moving, hot metal strip, and, as such, it is of little relevance to the present invention. As discussed in detail below, what may work in a cold metal and/or stationary context may not work in a hot metal, moving context. Thus, one of ordinary skill in the art would not have been motivated to apply the known prior art techniques to a system for measuring the flatness of a hot metal strip.

In contactless measuring systems for hot metal strips, the contrast between the lines generated by the light source, i.e., the increase in intensity detectable by a camera and the geometrically sharp limit of the light coming from the surface of the metal strip, and the contrast of the light emissions of the hot surface surrounding the areas of the shadow is very important. If the difference in intensity between the

purposefully generated lines of light and the shadow lines lying therebetween is not sufficiently discernable (because the hot metal strip itself emits light), a reliable determination of the exact course of the lines will not be possible.

Furthermore, the difference in intensity is dependent on the resolution capability of the camera, which depends on the technology of the camera. The camera can be saturated at high intensity levels in such a way that the camera cannot distinguish between the light emissions of certain iluminated sections and light emissions from non-illuminated sections. In fact, U.S. Patent No. 5,488,478 acknowledges these problems and recognizes that the camera may be a limiting factor (see column 3, lines 63 to column 4, line 9, and especially column 4, lines 32-37).

Thus, one of skill in the art interested in developing methods for measuring the surface geometry of a <u>hot</u> metal strip would have been faced with the basic problem that the metal surface to be measured is itself glowing red and thus emits light at a very high intensity. For this reason, in order to produce an artificial light intensity concentration in front of the immense background emission, and in order to detect the concentration even after filtering, U.S. Patent No, 5,488,478 discloses a completely different approach, namely, the use of very powerful lasers (column 4, line 3). Thus, U.S. Patent No.

5,488,478 actually leads away from the method of the present invention. Significantly, the method of the present invention does not require the use of such lasers and, in fact, does not use such lasers.

When measuring the flatness of a hot metal strip, it is also important that the measurement be reliable and substantially free of errors, especially when the results are to be used in a fine control rolling and/or coiling steps. This requires consideration of several factors that must be taken into account. Indeed, the controllers are at times so sensitive that a small error in the measuring result used in the control can lead to a destructive accident in the finishing stands. The cost of such damaging accidents and the cost of scrap production, which may also result from faulty controls within the highly demanding field of hot metal strip products, make it less likely that one of skill would have conducted experiments to find and reach the optimal results.

Thus, for the reasons discussed above, it would not have been obvious to take methods disclosed in a different context and apply them to the measurement of flatness of a moving hot metal strip, as recited in new Claim 8 of the present application. Applicants submit that some appreciation concerning the applicability of the method of projecting shadows in the form of a line pattern (as claimed in the present

application) onto a moving hot metal strip would have been necessary in order to teach one of ordinary skill in the art to use the same. However, none of the documents previously cited or submitted herewith describe the use of the projecting methods in the context of a hot metal strip, and any contrary conclusion can only be the result of impermissible hindsight. For these reasons, new Claim 8 and its dependant claims are neither shown nor suggested by the '478 patent or any other known prior art.

New Claim 11 is directed to a method for continuously measuring the flatness of an end face of a coil when coiling a metal strip. The method includes the steps of projecting a shadow in the form of a line pattern onto the end face and detecting the line pattern on the end face with a camera. Applicants submit that none of the art previously submitted and/or submitted herewith shows, suggests, or is even concerned with projecting a shadow in the form of a line pattern to the end face of a coil.

When considering methods for measuring the flatness of an end face of a coil, one must keep in mind that the end face of a coil is not simply one single side of a face of a strip. The end face of a coil includes the side surface of one strip coiled together. Very often, coiling the strip results in different line patterns at the point where the different strip sections

lie on top of one another. Also, the coil might be coiled in an inexact manner.

For example, one coil section may, during rolling, be set down in a different position along the longitudinal axis of the coil. Thus, the coil end surface is not a plane surface. One of ordinary skill in the art would expect that interfering shadows of one coil section projected onto the next coil section in the illuminated sections of the projection would make the picture taken by the camera impossible to analyze. This is because analysis would not adequately detect which shadows were caused due to the projection and which shadows were caused due to inexact coiling.

Thus, only with some disclosure or appreciation that such projection methods are applicable to methods for measuring the flatness of an end face of a coil could claims of the present invention be even remotely considered obvious in view of the prior art. However, as set forth above, as the cited documents and those included herewith do not provide such a disclosure, one of ordinary skill in the art would have had no guidance and would have had no reason to believe that applying the projecting methods to the specific technical field would have worked.

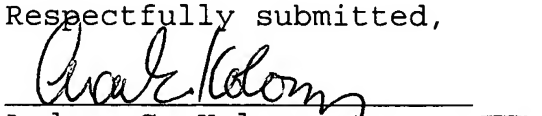
Finally, Applicants submit that the known methods of measuring the flatness of a moving hot metal strip as, for example, represented by U.S. Patent No. 5,488,478 require highly

complex devices including a rotatable mirror, which may limit the operational speed of the system (i.e., because of, for example, the need to rotate the mirror). The method of the present invention does not require such complex devices. The present invention provides a simple and effective method for measuring the flatness of a hot metal strip and the fine control of rolling and/or coiling parameters. For these reasons, the method of Claim 11 is neither anticipated nor would it have been obvious based on the prior art.

Enclosed herewith is an Information Disclosure Statement for the present application. The Information Disclosure Statement includes references cited in the parent application, U.S. Patent Application Serial No. 09/034,481. Additional references are also included. It is requested that all of the references be considered cited and made of record in the present application.

Favorable consideration of new Claims 8-15 is respectfully requested.

Respectfully submitted,



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